Claims

1. A method for coding an audio signal to obtain a coded bit stream, comprising the following steps:

   (a) transforming discrete-time samples of the audio signal into the frequency domain to obtain spectral values which represent the audio signal;

   (b) coding the spectral values with a code table having a limited number of code words of different length to obtain spectral values coded with code words, the length of a code word which is assigned to a spectral value generally being that much shorter the higher the probability of occurrence of the spectral value is;

   (c) determining a raster for the coded bit stream where the raster has equidistant raster points (10, 12, 14) and where the separation (D1) of the raster points depends on the code table; and

   (d) positioning priority code words, which represent particular spectral values which are psychoacoustically important compared to other spectral values, in the raster so that the start of each priority code word coincides with a raster point.

2. A method according to claim 1,

   wherein a plurality of windows is used, whereby a plurality of sets of spectral values results, where each set of spectral values comprises the complete spectrum; and

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wherein the following step is also performed before the step d):

defining code words which code spectral values of the same frequency from the respective sets to be priority code words.

3. A method according to claim 1 or 2, wherein a code word of the code table codes a plurality of spectral lines, the spectral lines being combined into groups or units in such a way that the number of spectral lines in a group is divisible by the plurality of spectral lines which a code word codes.

4. A method according to claim 3, wherein various code tables with different dimensions, i.e. spectral lines per code word, are used, a unit having n spectral lines, where n is a common multiple of all the dimensions which occur.

5. A method according to one of the claims 1 to 3, wherein the code words which code the spectral lines of the sets of spectral values which are assigned to low frequencies are defined to be priority code words.

6. A method according to claim 5, wherein the step of defining also includes the following step:

placing the code words in sequence in a sort table, priority code words being code words in the front part of the sort table and therefore more likely to be positioned on raster points than code words further back in the table, in such a way that the sequence of code words in the sort table constitutes a priority distribution within the code words, thus producing priority code words;

successive positioning of the code words from the sort table on raster points until no raster points are left;

positioning the remaining code words from the sort table at locations in the raster which are still unoccupied.

7. A method according to one of the preceding claims, wherein priority code words are code words which code spectral values with low frequency and/or high energy.

8. A method according to one of the preceding claims, wherein the distance between the raster points is somewhat smaller than, equal to or greater than the longest code word of the code table or is equal to or greater than the longest code word actually appearing in the bit stream.

9. A method for coding an audio signal to obtain a coded bit stream, comprising the following steps:

(a) transforming discrete-time samples of the audio signal into the frequency domain to obtain spectral values which represent the audio signal;

(b) grouping the spectral values into adjacent spectral sections, each spectral section having at least one spectral value;

(c) assigning at least two different code tables from a predetermined number of code tables to two different spectral sections, a spectral section having assigned to it that code table which is best suited for coding the spectral values in the spectral section;

(d) coding the spectral values from the spectral sections with the code table which is assigned to the corre-

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sponding spectral section, the length of a code word which is assigned to a spectral value being in general that much shorter the higher the probability of occurrence of the spectral value is;

(e) specifying a raster for the coded bit stream such that the raster has at least two groups of raster points (10, 12, 14 and 14, 16, 18), such that the raster points of each group are spaced equidistantly from one another and such that the raster point distance (D1 or D2) of each group depends on an appropriate code table from among the at least two different code tables; and

(f) positioning priority code words, which represent certain spectral values which are psychoacoustically important compared to other spectral values, in the raster so that the start of each priority code word of each code table coincides with a raster point (10, 12, 14 or 14, 16, 18) in the corresponding group of raster points.

10. A method according to claim 9, wherein the following step is performed before step (f):

defining a code word to be a priority code word when an indicator, which depends on the code table from which the code word originates, indicates priority.

11. A method according to claim 10, wherein the indicator indicates the highest priority when the code table on which the indicator depends has the highest absolute value of all the code tables.

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12. A method according to one of the claims 9 to 11, wherein a plurality of code tables is used, where there is an indicator for each table, where the indicator is determined by the highest absolute value of the respective table and where the indicator for a table with a greater maximum absolute value indicates a higher priority for a code word from the table than does an indicator for another table with a smaller maximum absolute value.

13. A method according to one of the claims 9 to 12, wherein the raster point distance (D1, D2) of each group of raster points is smaller than, equal to or greater than the length of the longest code word of the corresponding code table.

14. A method according to one of the claims 9 to 12, wherein the raster point distance (D1, D2) of each group of raster points is equal to the length of the longest actual code word for a spectral value in the corresponding spectral section; and

wherein the length of the longest actual code word of a spectral section is transmitted as side information to the bit stream.

15. A method according to one of the claims 9 to 12, wherein the raster point distance of a group of raster points is so determined as to be equal to the minimum of the longest actual code word of all the grouped spectral sections and the longest code word of the code table of this group, and where the longest actual code word is transmitted to a decoder as side information.

16. A method according to one of the preceding claims, wherein a substantially linear arrangement of the code words with

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frequency is adhered to in the raster of the bit stream both for the priority code words and for the non-priority code words.

17. A method according to one of the claims 1 - 15, wherein the code words which represent coded spectral values are arranged in the raster of the bit stream independently of the frequency of the corresponding spectral values.

18. A method according to claim 17, wherein information regarding the correspondence between the frequency and the code word is inserted in the bit stream as side information when the frequency independent distribution is not predetermined.

19. A method according to one of the preceding claims, wherein only each n-th code word of the priority code words is arranged in the raster of the bit stream while the remaining priority code words and non-priority code words are not aligned with raster points.

20. A method according to one of the preceding claims, wherein the spectral values are quantized prior to coding taking the psychoacoustic model into account.

21. A device for coding an audio signal to obtain a coded bit stream, comprising:

(a) a unit for transforming discrete-time samples of the audio signal into the frequency domain to obtain spectral values which represent the audio signal;

(b) a unit for coding the spectral values with a code table having a limited number of code words of different lengths to obtain spectral values coded with code

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words, the length of a code word which is assigned to a spectral value generally being that much shorter the higher the probability of occurrence of the spectral value is;

(c) a unit for determining a raster for the coded bit stream where the raster has equidistant raster points (10, 12, 14) and where the separation (D1) of the raster points depends on the code table; and

(d) a unit for positioning priority code words, which represent particular spectral values which are psychoacoustically important compared to other spectral values, in the raster so that the start of each priority code word coincides with a raster point.

22. A device for coding an audio signal to obtain a coded bit stream, comprising:

(a) a unit for transforming discrete-time samples of the audio signal into the frequency domain to obtain spectral values which represent the audio signal;

(b) a unit for grouping the spectral values into adjacent spectral sections, each spectral section having at least one spectral value;

(c) a unit for assigning at least two different code tables from a predetermined number of code tables to two different spectral sections, a spectral section having assigned to it that code table which is best suited for coding the spectral values in the spectral section;

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(d) a unit for coding the spectral values from the spectral sections with the code table which is assigned to the corresponding spectral section, the length of a code word which is assigned to a spectral value being in general that much shorter the higher the probability of occurrence of the spectral value is;

(e) a unit for specifying a raster for the coded bit stream such that the raster has at least two groups of raster points (10, 12, 14 and 14, 16, 18), such that the raster points of each group are spaced equidistantly from one another and such that the raster point distance (D1 or D2) of each group depends on an appropriate code table from among the at least two different code tables; and

(f) a unit for positioning priority code words, which represent certain spectral values which are psychoacoustically important compared to other spectral values, in the raster so that the start of each priority code word of each code table coincides with a raster point (10, 12, 14 or 14, 16, 18) in the corresponding group of raster points.

23. A method for decoding a bit stream representing a coded audio signal, where the coded bit stream contains code words of different lengths from a code table and has a raster with equidistant raster points (10, 12, 14), where the code words include priority code words, which represent particular spectral values which are psychoacoustically important compared to other spectral values, and where priority code words are aligned with raster points, comprising the following steps:

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(a) detecting the distance (D1) between two adjacent raster points;

(b) resorting the priority code words, which are aligned with the raster points, in the coded bit stream in such a way as to obtain a linear arrangement of the same with frequency, the start of a priority code word coinciding with a raster point;

(c) decoding the priority code words with an associated code table to obtain decoded spectral values; and

(d) transforming the decoded spectral values back into the time domain to obtain a decoded audio signal.

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24. A method for decoding a bit stream representing a coded audio signal, where the coded bit stream contains code words of different lengths from at least two code tables and has a raster with at least two groups of equidistant raster points (10, 12, 14 and 14, 16, 18), where the code words include priority code words, which represent particular spectral values which are psychoacoustically important compared to other spectral values, and where priority code words are aligned with raster points, comprising the following steps:

(a) detecting the distance (D1, D2) between two adjacent raster points;

(b) resorting the priority code words, which are aligned with the raster points, in the coded bit stream in such a way as to obtain a linear arrangement of the same with frequency, the start of a priority code word coinciding with a raster point;

(c) identifying the code table associated with a spectral section;

(d) decoding the priority code words of a spectral section with the corresponding associated code table to obtain decoded spectral values; and

(e) transforming the decoded spectral values back into the time domain to obtain a decoded audio signal.

25. A device for decoding a bit stream representing a coded audio signal, where the coded bit stream contains code words of different lengths from a code table and has a raster with equidistant raster points (10, 12, 14), where the code words include priority code words, which represent particular spectral values which are psychoacoustically important compared to other spectral values, and where priority code words are aligned with raster points, comprising:

(a) a unit for detecting the distance (D1) between two adjacent raster points;

(b) a unit for resorting the priority code words, which are aligned with the raster points, in the coded bit stream in such a way as to obtain a linear arrangement of the same with frequency, the start of a priority code word coinciding with a raster point;

(c) a unit for decoding the priority code words with an associated code table to obtain decoded spectral values; and

(d) a unit for transforming the decoded spectral values back into the time domain to obtain a decoded audio

signal.

26. A device for decoding a bit stream representing a coded audio signal, where the coded bit stream contains code words of different lengths from at least two code tables and has a raster with at least two groups of equidistant raster points (10, 12, 14 and 14, 16, 18), where the code words include priority code words, which represent particular spectral values which are psychoacoustically important compared to other spectral values, and where priority code words are aligned with raster points, comprising:

(a) a unit for detecting the distance (D1, D2) between two adjacent raster points;

(b) a unit for resorting the priority code words, which are aligned with the raster points, in the coded bit stream in such a way as to obtain a linear arrangement of the same with frequency, the start of a priority code word coinciding with a raster point;

(c) a unit for identifying the code table associated with a spectral section;

(d) a unit for decoding the priority code words of a spectral section with the corresponding associated code table to obtain decoded spectral values; and

(e) a unit for transforming the decoded spectral values back into the time domain to obtain a decoded audio signal.

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